SUPPLEMENT
TO
THE TELEGRAPHIC JOURNAL.
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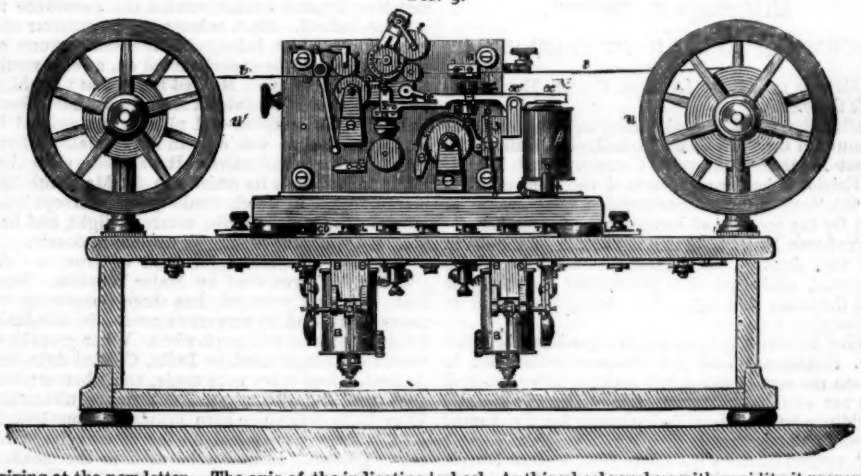
M. CHAMBRIER'S TYPE-PRINTING TELEGRAPH.

M. CHAMBRIER has recently patented an instrument which may be employed either as a type-printer or as an ordinary dial-telegraph. The truly original part of this apparatus is the manipulator, in which is combined a clock-work movement, together with an independent handle. Each time that the handle of the manipulator is pressed into the notch corresponding to one of the letters of the alphabet the pressure exercised by the handle effects the liberation of the clock-work movement. A needle concentric to the handle is immediately caused to revolve under the view of the operator, leaving the letter formerly indicated and

FIG. 9.



arriving at the new letter. The axis of the indicating needle carries the sinous wheel intended to work, as in all dial-telegraphs, the lever transmitting the current to line. The interruptions of the current which determine the successive movements or throws of the needle of the receiver are produced by an automatic mechanism, of which the velocity, previously regulated, is not influenced by the hand of the operator. Further, this mechanism is independent of the direction in which the handle of the manipulator is turned to attain the desired letter. This end is attained by a very simple and elegant arrangement. The principal feature is a wheel centred upon the common axis of the indicating needle and the handle, which has a number of teeth equal to the number of letters or signals. These teeth are inclined similarly to the wheels of a turbine receiving the water upon its superior face. This wheel is arranged in such a manner as to be capable of a slight movement, through a very small angle, from its normal position, to which it is carried back by a spring. It is situated beneath the dial of the manipulator, in which is pierced a number of apertures corresponding to each of the teeth. Every time the handle is carried to one of the stop-notches, a pin, with which it is armed, passes through one of the apertures and bears upon one of the teeth of the wheel; the action of this pin upon the inclined plane formed by the tooth which it touches determines in the wheel a slight rotation, which has the effect of displacing the lever confining the clock-work, and setting the indicating needle at liberty. In order to limit the course of the indicating needle there is mounted on the same axis, but beneath the dial, a parallel needle; this needle in turning is arrested by the pin of the handle, and is fixed in a line with the letter to which the indicating needle attains. When the operator releases the handle, the clock-work mechanism is stopped, to be again set at liberty the moment the handle is depressed.

The receiver is provided with a type-wheel of small diameter. This wheel is impelled by clock-work mechanism, which is liberated in the ordinary manner by the aid of an electro-magnet rendered periodically active by the manipulator. The impression is effected by means of a second electro-magnet controlled by a local battery, which lifts the paper into contact with the type-wheel. The printing magnet is put into action by a spring vibrating horizontally, and provided with a cam working in the teeth of a ratchet wheel. As this wheel revolves with rapidity it prevents, by repeated shocks, the falling of the spring, and the current is prevented passing into the electro-magnet. When the wheel stops the cam falls into one of the notches of the wheel, and the spring establishes continuity in the circuit formed by the local battery with the printing electro-magnet.

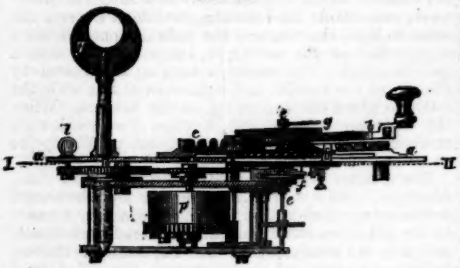
In the engravings with which the description of the apparatus is illustrated, the reference letters designate the same parts of the instrument.

The Manipulator, Fig. 9. *a a*, clockwork manipulator and independent handle. *b*, handle of the manipulator, which can be turned indifferently in any direction. *c*, crown of notches, into which the handle is depressed at each letter of the word to be forwarded. *d*, disc placed in the plane of the dial; attached solidly to the handle *b*; it turns with this in all directions. *e*, vertical axis, carrying towards the base a wheel gearing with the clock-work; higher, the sinuous contact wheel; and above the handle *b* an indicating needle. *f*, sinuous contact wheel. *g*, indicating needle. *h*, facet wheel, the use of which has been explained. *l*, button for setting the needle to zero.

Printing instrument. *r*, type-wheel. *s*, inking

cylinder. *t*, paper riband. *u u'*, *v v'*, wheels for the paper riband. *w*, printing hammer. *x*, oscillant lever, determining blow of printing hammer. *y*, spring to lever. *z*, ratchet wheel. *a*, steel cam working in teeth of ratchet

FIG. 10.



wheel *z*. *β*, printing electro-magnet worked by local battery, the continuity of the circuit being determined by the lever *x*. *γ*, line electro-magnet.

Proceedings of Societies.

SOCIETY OF TELEGRAPH ENGINEERS.*

ABSTRACT.

February 12, 1873.—LATIMER CLARK, Esq., C.E., took the chair.

After the usual formal business, the CHAIRMAN announced that Mr. C. F. Tachell, chairman of the Great Northern Telegraph Company, and Mr. H. G. Erichsen, had each presented the sum of £100 to the Society, and contributed a further sum of £25 for the purpose of becoming a life member.

Professor FOSTER, in moving a vote of thanks to the two donors, which was seconded by Major WEBBER, said that the generosity of the gifts was the more striking as the Society was yet in its infancy.

The SECRETARY read a correspondence between Mr. Scudamore and the Postmaster-General, in which the former asked for, and the latter granted, the use of the instrument-room of the new postal buildings in St. Martin's-le-Grand for the annual *soirée* of the Society.

A communication from Mr. WILLOUGHBY SMITH, "*On the Effect of Light on the Conductivity of Selenium*," was read by the Chairman. The author stated that, being desirous of obtaining a more effective high resistance for use in connection with his system of signalling with long submarine cables, he was induced to experiment with bars of selenium, a metal of very high resistance. He took several bars of the metal, of from 5 to 10 c.m. in length and 1 to 1½ m.m. in diameter. Each bar was hermetically sealed in a glass tube, and had a platinum-wire at each end for the purpose of connection. The early experiments did not place the metal in a very favourable light for the purpose required, for although the resistance was all that could be desired, yet there was a great discrepancy in the test. Upon investigation it was found that the resistance altered materially, according to the intensity of the light to which the metal was subjected. When the bars were fixed in a box with a sealed cover, so as to exclude all light, their resistance was at its highest, and remained very constant, fulfilling all the conditions necessary to the requirements; but immediately the cover of the box was removed the conductivity increased from 15 to 100 per cent, according to the intensity of the light falling on the box. Merely intercepting the light, by passing the hand before an ordinary gas-burner placed several feet from the bar increased the resistance from 15 to 20 per cent. If the light be intercepted by glass of various colours, the resistance varies according to the amount of light passing through. To insure that temperature in no way affected the experiment, one of the bars was placed in a trough of water, so that there was about an inch of water for the light to pass through. The results were the same. And when a strong light from the ignition of a narrow band of magnesium was held about 9 inches above the sealed tube, the resistance immediately fell more than two-thirds, returning to its normal condition immediately the light was extinguished.

The CHAIRMAN said that he had himself witnessed the experiment, and could confirm the statement that the sensitivity to light of the resistance of selenium was very great. A lucifer match or Argand burner caused the resistance to become halved. Such substances as sulphur and phosphorus, which belonged to the same group as selenium, would be experimented on, as also would the metal tellurium. He had heard that plumbago had been shown to exhibit slightly similar effects. Selenium, like sulphur and phosphorus, existed in two forms, but it was only in its crystalline form that it became conductive. It was quite clear that heat did not affect its resistance, for Mr. Smith had placed rock-salt, which would quite intercept heat, between the metal and the source of light, and had obtained the same results as without rock-salt.

A paper "*On the Application of Iron in Telegraph Poles*," was read by Major WEBBER. Iron, both cast and wrought, has been employed for many years, and in numerous modes, in standards for the support of telegraph wires. When great lines came to be constructed in India, Central Asia, and Australia, iron poles were made, and when erected, answered all ordinary constructional requirements. They have ever since been proving themselves to be the most economical means of carrying wires above ground. Iron can be used in the smallest quantity requisite to carry the weight. In other words, lines can be built according to true principles of construction, and the engineer has only to provide the requisite quantity of iron to ensure rigidity and steadiness. The difficulties of transport, labour, and maintenance, in countries of scanty population, give, upon a comparison of wood with iron, a very large result in favour of employment of the latter material. The experience of building lines of telegraph along the roads of such a country as the United Kingdom, shows that an endless variety of conditions affects the consideration of the engineer in constructing and placing his poles; and the main features of these conditions are due to the form of the road which the line follows. The road telegraph builder has to keep in view two distinct forms of construction,—the one a series of straight lines with angular changes of direction; the other a series having curved changes of direction, combined with continuous and irregular curves. In other words, he changes direction either by curves or angles. It is this view of the case which

* Reported, with the consent of the Council, for this Journal.

materially influences the application of iron to telegraph poles. When you have all the difficulties of road construction to contend with, experience seems to point out that straight lines and angles enable you to distribute the costly pole material in the most economical way. This entails the use of a pole which is sufficiently strong to carry the weight of the wire at the requisite height from the ground, without bending, and rigid enough to resist the pressure of wind. When placed in a straight line the poles will require no side support, but when placed at an angle they must not be expected to resist the strain without it. It sometimes becomes necessary to make poles which will carry the strain of wires with no other means of resistance than that afforded by the ground in which they are placed. The next point to be considered, after its absolute strength, is the fixing of the pole so that the mass which holds it may be capable of resisting the pressure to which it is subject. We shall find that there is a centre about which this lever turns, and which will be somewhere below the ground, the position varying with the comparative resistance of the material which holds the pole in the bottom of the hole and the surface of the ground. It is not difficult to make a pole of the requisite strength, but it is difficult to obtain a sufficiently unyielding mass to hold it upright. The author had doubted the expediency of those proposals for iron poles which adopt the plan of terminating the lower extremity with a base plate. It can be seen at a glance that, unless the plate is so large as to carry a weight of material greater than can be lifted by the strain such a plate is a disadvantage, as its use necessitates a large excavation, and disturbs the material on whose resistance to pressure so much depends. In one case the stability depends on the weight of the mass holding the plate down, in the other case on the resistance of the soil. Again, the existence of a plate at the base requires an increase of strength down to the plate; whereas a pole which depends only on the resisting power of the mass in which it is placed, against horizontal pressure, can be made strongest at a point above the vertical axis, by keeping that axis low, thus effecting a saving of the metal. Whatever may be the result of the enquiries which the Post Office authorities have instituted as to the pole of the future, it appears evident that to economise material, various classes of poles must be available in constructing such lines as it is required should be erected with iron instead of wooden poles in this country. There have been poles constructed like railway signal poles; poles like split taper tubes made of cast-iron, and having diaphragms at intervals inside; poles connected telescopically; poles of cast- and wrought-iron; taper tubes connected with socket joints; poles with cast-iron bases and taper tube tops; lattice and riband poles; poles with multiple bars; and poles of H and T iron section. The cost of these poles will be found to vary from £200 to £250 a mile. While a thorough investigation of this subject is being conducted by the engineer-in-chief of the Post Office, it would be premature of the author to go further into this question, or to describe his own views of what is required.

A paper, "*On Telegraph Poles*," was then read by Lieut. JEKYLL, R.E. The author said that it may not be unprofitable to regard certain practices, in connection with the use of the poles, from a theoretical point of view, analysing the forces and the strains to which they were subject, and then applying to practice the results of the theoretical analysis. The investigation of the subject is not without interest, as it confirms, in most particulars, the practice which has been arrived at by experience in the field. The author, therefore, proposed to place before the Society the calculations which revealed the nature of the strains. He should confine himself to one single branch of the subject, namely, the means used for supporting and strengthening poles which are subject to lateral strain. The paper then proceeded to give, in a long series of formulæ, analyses of the various strains arising from the wires, and of the resistance thereto afforded by lateral supports. Theoretical considerations showed the superiority of stays and struts. The theoretical superiority is borne out in practice, and it is, in general, advisable to use stays in preference to struts in situations which admit of their employment.

A paper "*On Iron Telegraph Poles*," by Mr. C. W. SIEMENS, F.R.S., was read by the Secretary. The object of the construction of iron telegraph-poles was to provide lightness and convenience with the attainment of a maximum of strength and resisting power. This consideration led him to abandon the ordinary mode of fastening poles by setting considerable lengths of them underground, and to the adoption in its stead of a buckled wrought-iron plate. It is evident that a straight pole which has been fastened into the ground by only burying a part of it, will, if bent over by a sudden jerk, never attain its proper form again; whereas a pole which is fastened to a plate has always the whole weight of earth resting on the plate to keep it steady. The part of the post which is partly buried in the ground is of a tubular form. This tube is fastened to a buckled plate by means of four bolts, and is provided at its upper end with a suitable socket to receive the upper tube. The latter, which forms the principal part above ground, is made of wrought-iron. The shape which has been adopted for it is approximately the parabolic one,—that is to say, the top is for about 2 feet cylindrical, then tapering off towards the top. By this means is obtained a distribution of the metal, which, with a minimum expenditure of material, gives a maximum amount of rigidity. The proportion of the tube to the resistance of the metal is such that a horizontal strain establishes a balance between the tendency to collapse in the tube and the tendency to break. Therefore a tube of the same weight, but of larger diameter, would collapse, whereas if the diameter were decreased, and the thickness of the metal increased in the same proportion, the tube would break. The upper tube is usually cemented into the socket of the cast-iron pedestal tube by pouring into the annular space between the two tubes a fused cement, consisting of a mixture of sulphur and oxide of iron, which upon congealing sets extremely hard. Lately the author's firm has adopted a method of setting the iron tube with an inverted conical end into a conical socket at the upper end of the cast-iron tube. If only one or two wires are to be carried, and cheapness is an object, posts of a total length of 19 feet 8 inches are used, standing 17 feet above ground. Such a post will support a dead weight of 560 lbs., suspended horizontally from its upper

extremity over a pulley, without showing a permanent bearing. The cost of these iron posts has varied from 22s. 6d. to £3 16s., according to their dimensions and the fluctuations in the price of iron. As a rule, they may be taken to be from two to three times dearer than ordinary wooden posts of the same strength. In southern countries, where wood is subject to the dry rot, and where wooden posts have to be renewed every two or three years, the relative advantages of iron posts of this description have proved to be very great indeed.

A paper "*On the Riband Telegraph Post*," by Mr. Robert Bristow Lee was read by the Secretary. This pole consists of a number of straight angle irons varying in number according to the length and diameter of the pole, surrounded by a series of wrought-iron ribands in reverse directions, riveted at each crossing with themselves, and also with the angle irons, and, thirdly, of a circular base plate with a tripod, to which the pole itself is firmly and securely attached. In the manufacture of these posts a hollow mandril is used, this being so constructed as to allow of its collapsing, or occupying a less diameter than when fixed for use. The exterior of the mandril is grooved with the required number of grooves from right to left at equal distances. An equal number of grooves is made from left to right, so that they intersect each other at regular intervals. These grooves form a receptacle for the wrought-iron ribands, which are put on by machinery in a very careful way, compensation being effected in the machine for the decreasing diameter of the pole towards the top. The bands in the first series are put on one after another from right to left, and from the base upwards, and their several ends secured. The second series are wound on in the reverse direction from left to right, starting at the top, and finishing at the bottom. The ends of these are also secured. The second series, consequently, externally overlap the first series; they are then bolted together. This is done with ease, for each riband, before being wound, has holes punched in it on a template, at regular and stated intervals. The packing of the mandril is removed, and the angle irons are then inserted.

The base is, in some instances, cylindrical, and supplied with a base plate. It is made separately, and is so transported with the poles wherever they may be required. The legs of the base are so grooved that the angle irons fit compactly into them, the base being pushed upwards inside the pole to the required length.

It was originally intended to arm the posts with wrought-iron brackets, but it has been found that the ordinary oak arm answers better. The arm is placed against one of the diameters of the post, the end passing through, and is secured with nuts. On screwing the nuts well up, it is found that the ribands cut for themselves places in the arm. The paper then gave in detail the dimensions and weights of two poles which have been supplied, for experimental purposes, to the Postal Telegraph Company. Two riband poles had supported a small platform loaded with 10 tons, without showing any signs of sinkage, deflection, or collapse. Experiments have been made to test the lateral strength of the pole. A pole 20 feet in length over all, was fixed longitudinally, so that the fulcrum corresponded with the ground line. The base was firmly secured, and weights varying from 1 to 5 cwt., were applied at the upper extremity of the pole. 1 cwt. caused a deflection of 1-quarter inch; permanent set *nil*. 2 cwts., deflection half inch; permanent set *nil*. 5 cwt., deflection 1 7-8ths inches; permanent set 9-16th. The post bent close to the foundation plate, but when the weight was taken off, the post became perfectly straight.

The Chairman said that it was too late to commence a discussion on the papers, and there would be a great advantage in deferring it to the next meeting, as the members could look up their notes on the subject and come prepared to deal with it on that occasion. Some of them might remember some experiments which were made by the telegraph companies, a few years ago, with reference to fixing wooden poles in iron sockets. Any information connected with poles would be very thankfully received.

AMERICAN ACADEMY OF ARTS AND SCIENCES, BOSTON, U.S.

November 27, 1872.—Dr. Henry Bowditch described a case of aortic aneurism in which electricity was applied in treatment. Two operations were made, and three needles coated with vulcanite were used at each operation. They were introduced about an inch at the first, and an inch and a half at the second operation. The positive pole of the battery *alone* was applied to them, the negative resting on the right breast on a level with the tumour. The operations lasted fourteen minutes, and the number of cells employed (Stone's battery) was gradually raised from two to sixteen at the first, and to twenty-eight at the second operation. The patient is said to have experienced relief, but the influence upon his radical cure is uncertain.

December 10.—Prof. E. C. Pickering exhibited a new form of theodolite magnetometer, which may be constructed at small expense from a common surveyor's transit. A mirror and magnet, like that of a Thomson's galvanometer, is attached to the cap of the telescope, and a right-angled prism and cross-hairs are placed in front of its eye-piece. The telescope is turned until the image of these cross-hairs is brought to coincide with those already in the eye-piece, when the axis of collimation will be exactly at right angles to the magnetic meridian.

Societies' Meetings for the Month.

Meteorological Society.—Feb. 19, at 7 p.m. "Description of an Electrical Self-registrating Anemometer and Rain-gauge," by the Rev. Fenwick W. Stow, M.A., F.M.S.; "On some Results of Meteorological Telegraphy, by Robert H. Scott, M.A., F.R.S.; and other papers.

Geological Society.—Feb. 26.—March 12. At 8 p.m.

The Society of Telegraph Engineers.—Feb. 26.—March 12. At 7.30 p.m.

To Correspondents.

A. Eden.—We shall be glad to have the sketch of your Duplex Telegraph for our next Number.

J. H. Morby.—There is no good account published.

S. E. P.—Mr. Ayrton's letter will probably render the insertion of yours unnecessary.

Government Employe.—The description will appear as soon as we are able to publish it.

H. S. Langford, A Supporter of the Telegraphic Journal, and others.—The second part of our "Students' Column" will meet your requirements. Read Mr. Culley's "Handbook."

J. Smythe.—We shall be glad to hear from you.

W. L. Scott, G. Preece, H. Yeates, S. E. Phillips, junr., W. E. Ayrton, R. Sabine, H. G. Erichsen, Latimer Clark, and R. Werdermann are thanked for their communications.